

# Neonatal meningitis caused by streptococcus pneumonia in Iran

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## ABSTRACT

Meningitis, pneumonia, and sepsis in newborns and young infants (age < 60 days) are the main causes of childhood mortality in developing countries. Even though streptococcus pneumonia is the most commonly detected microorganism in pediatric bacterial meningitis, it is rare in newborn infants. The following article reports a case of pneumococcal meningitis that was detected early in a newborn infant in 2013. A female baby was born by vaginal delivery with a birth weight of 2900 grams. She was symptomatic (poor feeding) from her first day of life, but she was admitted with a toxic status (dehydrated, lethargic, cyanotic, hypo tone, hypo reflex) to our referral center on her third day life. Her blood culture showed no growth of any organism and her urine culture was also negative, but the Cerebrospinal fluid (CSF) culture showed growth of streptococcus pneumonia. The maternal sepsis workup was normal. Despite all therapeutic management, unfortunately, the patient died on her fourth day after admission.

**Key words:** neonate, meningitis, streptococcus pneumonia

## Introduction

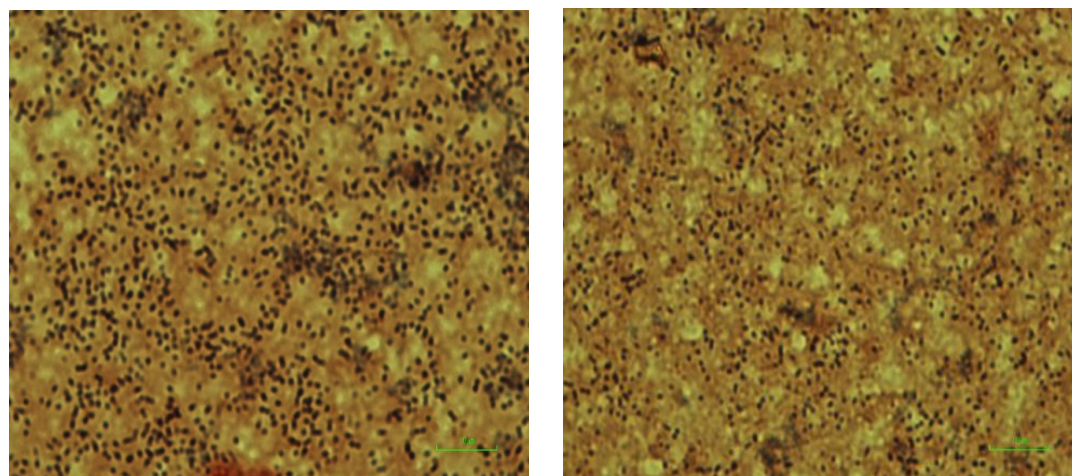
Meningitis, pneumonia, and sepsis in newborns and young infants (age < 60 days) are the main causes of childhood mortality in developing countries (1). In neonates, meningitis is a devastating disease. It is fatal in more than half of the cases and may produce severe post infection sequelae, including brain abscess, hydrocephalus, deafness, and developmental delay (2). Despite the use of modern drugs and diagnostic measures, neonatal meningitis remains an important cause of high mortality and long term morbidity (3). The etiology of bacterial meningitis is affected by the age of the patient (4). In the neonatal period, group B streptococci causes most of the cases of bacterial meningitis in many developed countries. Coliform bacilli are the second most common meningeal pathogens in this population. In many developing countries, *Escherichia coli* and other gram negative bacilli are the leading cause of meningitis in newborns (5). Even though *S.pneumonia* is the most commonly detected microorganism in pediatric bacterial meningitis, it is rare in newborn infants (6). The following is a report of a case of *S.pneumonia* in a neonate with bacterial meningitis.

## Case report

A female baby was born by spontaneous vaginal delivery after 38 weeks of gestation with a birth weight of 2900 grams, a length of 48 cm, and head circumferences (HC) of 33cm. The mother was 19 years old and primigravida. Her pregnancy was uneventful and without premature rupture of membrane. There was no evidence of fever, gestational UTI, specific disease, or chorioamnionitis. The patient had poor feeding in the first day, but her parents did not allow hospitalizing their child. During her second day of life, she developed poor feeding and lethargy. They attended our referral hospital (Taleghani Hospital in Gorgan) and the neonate was admitted in the neonatal intensive care unit (NICU) on her third day of life.

At the time of admission, the patient was toxic, dehydrated, and cyanotic. Her respiratory status was gasping. She had bulging anterior fontanel, grunting, and jaundice. Her pupils were midsize and reactive. She exhibited hypotonia and hyporeflexia with bilateral congenital dislocated hips (CDH) and sacrum dimpling. She had bradycardia (HR=50) and hypothermia (axillary

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**Figure 1.** CSF smear shows many gram positive diplococci

Tem=35.4). Her blood pressure was 50/30 and her first O<sub>2</sub> saturation was 30%. The neonate was immediately intubated and put under a ventilator. Stat normal saline serum was ordered. A sepsis workup was done and empirical treatment with ampicillin, amikacin, and cefotaxim was initiated. Conventional phototherapy started. In the first ABG, the patient had mixed metabolic and respiratory acidosis. Her complete blood count (CBC) showed a hemoglobin level of 13/6 gr/dl; her white blood cell count (WBC) was  $1.3 \times 10^9/L$  with 70% neutrophil and 30% lymphocyte; and her platelets were at  $64 \times 10^9/L$ . Another lab test included PT: 17.7 sec, PTT: 48 sec, INR: 1.89, Bil: 8.2 mg/dl. The patient's blood sugar was 172 mg/dl, C-reactive protein was 51 electrolytes; her creatinine, blood urea nitrogen, lactate, and ammonia levels were all at a normal range. Her chest x-ray showed a normal lung with normal cardiac size. In the first hour after admission, a lumbar puncture was done. The fluid was semi clear with a WBC of  $14 \times 10^6/L$  (%80 polymorph nuclear leukocytes), RBC of  $15 \times 10^6/L$ , glucose of 12 mg/dl with blood glucose of 91 mg/dl, and protein of 290 mg/dl. Many gram-positive diplococci were seen with a gram stain (Figure 1). The CSF culture showed growth of *S.pneumonia*, and it was sensitive to ceftriaxon, gentamycin, tubramycin, vancomycin, cefixime, clindamycin, and meropenem. The patient received Intravenous immunoglobulin (IVIG), Granulocyte-colony stimulating factor (GCSF) and fresh frozen plasma (FFP) and also dopamine because of persistent hypotension.

On her second day following admission, it was clear that the condition of the patient was deteriorating. Her antibiotics were changed to vancomycin and meropenem due to the CSF

antibiogram. Focal colonic seizure happened in the second day after admission, and phenobarbital was started. On the second day, the patient's CBC showed a hemoglobin level of 9/6 g/dl, a WBC of  $8.3 \times 10^9/L$  with 83% neutrophil and 17% lymphocyte, and platelet levels of  $24 \times 10^9/L$ . She received a transfusion of packed cells and platelets. In serial ABGs, the patient had persistent respiratory acidosis resistant to high ventilator setup. At the third day after admission, she had double midriatic pupils, and her GCS was 3.

A second LP was done on the third day after admission. CSF analysis showed a WBC of  $220 \times 10^6/L$  (%90 polymorph nuclear leukocytes), RBC of  $30 \times 10^6/L$ , and glucose of 30 mg/dl with blood glucose of 124 mg/dl and protein of 270 mg/dl. Less diplococci than the first time were seen on gram stain. CSF culture again showed growth of streptococcus pneumonia and it was sensitive to gentamycin, tubramycin, vancomycin, clindamycin and meropenem. Her blood culture showed no growth of any organism, and her urine culture was also negative. A maternal sepsis workup was done for her mother. Her CBC and urinalysis were normal and blood culture and urine culture were also negative for any organisms. Unfortunately, a maternal vaginal swab could not be performed in her. A brain ultrasound of the neonate revealed no hydrocephalus, cerebral hemorrhage, cerebral abscess, intraventricular hemorrhage, ventriculitis, or subdural empyema. Unfortunately, the patient died at on the fourth day after admission.

## Discussion

*S.pneumonia* is the leading cause of meningitis in children. However, it is very rare in the

neonatal period. Our patient had an early onset infection, and so community acquired pneumococcal infection is not probable but not ruled out for her. The incidence of invasive pneumococcal disease in Western Europe has been reported as 27 cases per 100,000 children in less than two years (7). In a study by Giorgi Rossi, *streptococcus spp.*, was the primary cause of meningitis (17.2%) in the first three months of life (8). *Pneumococcus* is probably the leading cause of community-acquired meningitis in newborns. Lower socioeconomic status and overpopulated living conditions may have a role in both incidence and prognosis of neonatal meningitis (6). The primary colonization site of pneumococci is the nasopharynx. However, there is limited information on the frequency of nasopharyngeal colonization in newborns.

Although the level of polymeric immunoglobulin binding receptor in neonates is unknown, a possible deficiency in this receptor level would make invasion difficult and the probability of pneumococcal infection would be unlikely. However, once pneumococcal bacteremia develops during the neonate period, it has about a 50% mortality rate and poor prognosis, as it is too difficult to manage (6). Pneumococci may also reach the fetus or newborn infant via the trans placental route, secondary to maternal bacteremia, ascending infection from the maternal genital tract and passage through a colonized birth canal (9). There are rare reports of neonatal sepsis with pneumococci by vaginal transmission and endometritis (3, 10). In one study in Turkey, two patients without maternal risk factors, such as an early rupture of the membrane or endometritis, developed early pneumococcal sepsis with symptoms beginning on the third and fifth days of life (6). Regarding the treatment of pneumococcal meningitis, vancomycin should be the drug of choice in any neonate with gram-positive diplococci on the CSF smear (10).

The overall mortality rate of neonatal meningitis is 20-25% (13). It has been reported at 24% in England (3) and 34% in Africa (14). In one study, 50% of patients hospitalized for pneumococcal meningitis died during the newborn period. In a study conducted in Canada, a patient in a comatose state endured seizures lasting more than 3 days, and was in need of inotropic drugs; leukopenia was found as a factor for a poor prognosis of neonatal meningitis (15). Our patient had three of these four factors. In the Canada study, the patients with onset of symptoms < 29 hours before admission to the

hospital had better outcomes. Unfortunately, our patient had been admitted to the hospital about 40 hours after beginning of symptoms.

In conclusion, although pneumococcal meningitis is rare in the neonatal period, it has a high mortality and morbidity rate. Therefore, in any newborn with a toxic appearance who has been admitted in NICU, it seems necessary to perform a lumbar puncture as soon as possible to manage fatal but rare causes of neonatal meningitis.

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